

Editor's Introduction

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I have two main aims in writing this introduction. The first is to tell the story of how this edition, the first English language translation of the Tektology, came to be; the second is to provide, for the reader new to the Tektology some thoughts on the contents and value of Bogdanov's unique formulation. Beyond this, Vadim Sadovsky and Vladimir Kelle provide, in their foreword, an insight into their views as to the origins and development of the thought of Bogdanov which led to the creation of the Tektology.

Before beginning there are a few people I wish to thank. Bob Flood and Mike Jackson, the current and previous directors of the Centre for Systems Studies who both showed great foresight, in taking on trust the value of a large and complex project which had become a passion for me. Vladimir Kelle for spending many hours patiently explaining the finer points of the Russian language and listening to my suggestions for retaining the meaning of the terminology on its journey into English. Finally Vadim Sadovsky, his work as technical editor of the translation has been invaluable and the completion of this first stage of the project would have been unthinkable without his advice and support — to date the project has been underway for two years and during that time I have been proud to call him friend.

Five or so years ago I was dining with a Russian colleague, the conversation turned to the subject of the origins of systems theory. With typical western arrogance I was propounding the achievements of writers such as von Bertalanffy, Weiner, Ashby, etc., at this point in the proceedings he chose to tell me of Bogdanov and the Tektology. As the evening wore on a picture of a *universal man*

emerged and I was irredeemably hooked. Over the following months I managed to prise more and more detail out of him, Bogdanov's life story, his broad, almost incredible, intellectual interests and his problems with Lenin and orthodox Marxism. However, the institution where I was working was primarily a teaching institution and it seemed that my interest was not to be satisfied. Then serendipity stepped in. In October 1992 I moved to the Centre for Systems Studies at the University of Hull, during a pre-commencement meeting I mentioned my interest in Bogdanov and the Tektology to Mike Jackson who told me of George Gorelik's translation of "Essays in Tektology"¹ and the trail seemed to be re-opening.

About a year later I met Wojciech Gasparski, with whom I was later to co-operate on the re-edition of "Kotarbinski's Praxiology"², for the first time. As was my wont, I began to regale him with the story of the Tektology. It was him who told me of Vadim Sadovsky's involvement in the production of the 1989 edition of the Tektology³, the first since Bogdanov's death in 1928. A little later I travelled to Moscow to speak to Vadim Sadovsky and the die was cast for this translation.

As with all works taken across languages, there is a question regarding the extent to which the finished article is a *translation* and the extent to which it is an *interpretation*. Vadim Sadovsky, his team at the Institute for Systems Analysis of the Russian Academy of Science and I are all *systemists*, for want of a better word. Thus any interpretation brought into the work will tend to be biased toward an increased *systemization* of the Tektology. I am not, and cannot be, sure as to how much of a problem this is. Personally I believe the systemic nature of the Tektology pervades every nook and cranny of the work and, as it has been noted by such eminent scholars as, for

example, Gorelik, Sadovsky, Susiluoto and Zeleny⁴, do not feel that the possibility of a slight introduced bias is necessarily fatal.

In this first of three parts Bogdanov sets out the ground for the Tektology. In this book he describes the notions and historical necessity of Tektology, lays out its concepts, methods and its relationship to the philosophy and science of its time. He goes on to explore what he called the "Basic Organization Mechanisms", the formative and the regulative, and the possibility and conditions of "The Stability and Organization of Forms".

It is obvious that Bogdanov intended the Tektology as an *empirical science* as I have argued elsewhere with together with Simona Pustynnik⁵; and that as his Marxist leanings convinced him that such a science as Tektology was necessarily proletarian in nature, the role of Tektology was to change the world not merely contemplate its unity. Below I shall expound my understanding of the Tektology and the extent to which I consider it to be valuable to modern systems researchers.

One of the great problems of contemporary systems theory is the inability to integrate the various ontological grounds which underpin the many systems approaches. If one accepts the various available approaches as *metaphors for* rather than, strictly, *descriptions of* reality, this is, perhaps, not so great a problem. If however, one adopts the opposite view, the importance and size of the problem grows. Bogdanov required of the Tektology that it be a Science in the strong sense — therefore it needed a sound empirical base. However his second requirement — that it also be universally applicable meant that he needed to bring together, in a continuous model, "physical" and "psychic" phenomena in such a way that they were both susceptible to Tektological methods, i.e. that they could be both understood and manipulated using the *same* methods.

The ontological bases of the various systems approaches, from von Bertalanffy's GST onwards, fall into the category of either idealism or materialism. However such ontologies are rarely explicitly stated, systems theory, it seems, is largely epistemological, concerned more with ways of knowing than with the nature of what is known "in itself". von Bertalanffy's GST⁶, the cybernetic models of Wiener⁷ or Ashby⁸ and Prigogine's "self organizing systems"⁹, all assume a material world, where systemic models are used to create entities for knowing and which are investigated using primarily statistical methods. The same is true of the managerialist models, both Beer's Viable System Model¹⁰ and Checkland's Soft Systems Methodology¹¹ accept a material "reality" of which their methods provide a way of knowing and, potentially, controlling.

The "Critical Systems School" by taking the step into "methodological complementarity" brings us full circle. At one end of the scale the managerial need to deal with "fundamentally different problem situations" in a planned and systemic manner is isomorphic with the physicists need to deal with the "fundamentally different processes of micro and macro level systems, that is, those systems which obey the time-reversible laws of classical physics and those which obey the time-irreversible second law of thermodynamics. Put simply, the implication of the complementarity approach is that methodological complementarity is necessary because of ontological differences, in short, the cosmos consists in fundamentally and irreducibly different spheres.

Two points arise from the previous discussion: first that all theories of extant, rather than speculative, systems, in fact that body of knowledge that we would identify as *Systems Theory*, has a predominantly, if largely implicit or covert, materialist ontology; and second that the need for complementarity, however altruistically

intended, implies an epistemological weakness. Thus our ways of *particular* knowing are preventing us from achieving *general* knowing, the acceptance of the strict necessity of complementarism precludes the need for integration.

Bogdanov's starting point was that the world exists entirely as *organization* — this is its first similarity with systems theory. This begs the question "If the world *is organization*, what is organized?". Bogdanov gives two answers, reflecting the two meanings we give to the word. Complexes — the results of organization — are comprised of elements *and their inter-relationships* — specific elements are organized into specific complexes by virtue of their specific inter-relationships. Thus, in the first sense of the word, *elements* are organized, they are subject to the *process* of organization. Complexes, however, display the *quality of organizedness*, they are the *outcomes* of the process of organization, and are, therefore, organized in the second sense of the word. Thus for Bogdanov the world consisted of complexes which, in their turn, consisted of elements inter-related in specific ways.

This leads to the ontological questions "What are elements?", and, "What are inter-relationships?". The first question Bogdanov answers in the following manner:

"The world of experience, both physical and psychic, is entirely composed of *elements* — spatial, tactile, accoustical, thermal, etc.. Combinations of these elements make up different "phenomena", both psychic and physical. If the law of causality, inferred for all these phenomena — i.e. for the world of *elements connected by various relations* — is applicable to "things in themselves" serving as an *immediate link* between "phenomena" and "things", it is clear that

"phenomena" and "things in themselves" are of the *same nature*. "Things in themselves" would then represent a direct continuation of the world of *empirical elements* and in fact would be only *combinations of elements*."12

From this we can see not only Bogdanov's systemic bent, but also his general definition of *elements*. Elements are *objects of experience*, which, by virtue of "acknowledg[ing] the law of causality to be applicable to "things in themselves"" are as *real* as is the nature of experience. If the world we experience has a basis other than the purely psychic it must have an external cause, — the "things in themselves" — and, because of this causal link between phenomena and experience and the link between elements and phenomena; the mental world of representation and the external world of "things in themselves" are joined as links in a single causal chain. This "primary correlation" is the basis of Bogdanov's monism. Neither materialism nor idealism is prioritized because neither is sufficient, in isolation to produce *experience*; experience consists *necessarily* both in those "things in themselves" which "produce sensations" *and* in their cognition.

Thus, as changes in the phenomena we experience evidently occur, it is reasonable to assume that the "things in themselves", which are supposed to underlie them, are changing too, at least in terms of the inter-relationships which constitute the phenomena under observation, and, as we as actors can carry out specific acts and experience predictable outcomes as their result, it is also reasonable to assume that the law of causality applies to the "things in themselves". Therefore it is also reasonable to assume that the phenomena we experience reflects the "things in themselves". The complexes we observe and manipulate are phenomena, which reflect, in some way "things in themselves", and the phenomena we

experience are complex, consisting of elements and their inter-relations, which are, of course also phenomena which we experience and so on; therefore "things in themselves" are complex, i.e. consisting of elements and their inter-relations.

This, rather tortuous, reasoning gives us an ontological ground for complexes, elements and inter-relationships; they are all phenomena and therefore part of the causal chain of experience which links individual cognition to *reality*. However it tells us very little about elements other than that they are the parts into which complexes can be decomposed. And it tells us equally little about inter-relationships other than that they are the "glue" which binds elements into complexes. Perhaps we should return to Bogdanov's conception of organization for a clue.

Organizedness, for Bogdanov was relative, it depended on the point of view of the observer, actions or outcomes which were organizationally positive under one set of circumstances could, equally, be organizationally negative under another. In order to clarify his meaning in this respect Bogdanov categorized the organizedness of complexes in relation to the goals which were imputed to them. We can demonstrate this using a simple example:

An entrepreneur has a sum of money which he wishes to invest in a project with the aim of making a profit, the project carries a certain risk of failure and the current bank borrowing rate is constant. Therefore the baseline for success is a return on investment of the current bank rate plus a calculated risk premium. If the project makes a return above this baseline it would be regarded, by Bogdanov, as *organized*, if it makes a return equal to it, it would be regarded as *neutral* and if it makes a return below it, it would be regarded as *de-organized*. Thus the *organized* complex is one which is greater than the sum of its parts — another similarity with systems

theory. However, if the complex is set a different goal — minimizing pollution for example — it may be that the project which was *least organized* from the return on investment point of view becomes the *most organized* from the ecological point of view. In analysing the success or failure of his projects the entrepreneur will almost certainly decompose them into different parts or *elements* in order to understand the causes — supply costs, work rates, fuel consumption, etc., in the case of profit, and perhaps re-cyclability of waste, bio-degradability of constituents and air pollution etc., in the case of ecology consciousness.

Elements it seems are wholly "conventional" they are those parts it is *advantageous* to decompose a complex into in order to achieve a given task or goal.

In defining the "elements of organization" specifically, Bogdanov uses the term "activities-resistances" in order to convey the "relativity" inherent in his "organizational point of view" — what is positively valorized from the point of view of one complex, an "activity" — is negatively valorized from the point of view of another, opposing complex — a "resistance".

Inter-relationships, therefore, must also be relative, if we change the elements of a complex by changing its tasks or goals, surely the relationships between them must also change. This is a rather more difficult point. It would be difficult to deny that the internal relationships of the internal combustion engine are fundamentally the same whether we regard the motor car as a mode of transport or as an air pollution system, way may, however choose to manipulate or assign values to them in different ways in order to satisfy different "wider system" or environmental imperatives. The answer seems to be that, at some level *observed* interactions are *motive independent*

— although at all levels our *classification* of them as *organizing*, *neutral* or *de-organizing* will remain *motive dependant*.

Let us review our discoveries. Bogdanov considers the world to consist of *complexes* and that these complexes are made up of *elements* and their *inter-relationships*. Complexes, elements and inter-relationships as objects of experience are part of a single causal chain which connects the mental world of representations to the external world of "things in themselves". Elements, complexes and inter-relationships are conventional entities which we use in order to arrange our experience of the world and which can display, enhance or reduce the qualities of *organizedness* (positive), *neutrality* or *de-organizedness* (negative) in relation to specific goals¹³.

This brings us to a point where an embryonic systems theory can be identified. Beyond the notions of complexity and organizedness, the relationship of the elements to the whole implies a notion of hierarchy, and the implications of conventionality and relativity in conjunction with the idea of element as phenomenon leads to the notion of recursively applicable decomposition.

Tektology was intended as an empirical science, however, and experience, whatever its ground, is primarily a personal affair. Nothing that has been said above provides the basis for a science in the strict sense. Bogdanov, as a Marxist, put his faith in the "social nature of knowledge. Vucinich sums up this argument as follows:

"In brief psychical elements make up the experience that is dependent on the "individual subject"; physical elements make up the experience that is dependant on the "collective subject" ... Socialized knowledge, that is knowledge based on physical elements appears ... in two basic forms: technology and ideology ... Both are

systems of knowledge and knowledge is the basic tool of human development." ¹⁴

As we can see from this Bogdanov creates the physical world from the psychical, the shared or "socialized" experience of the group creates "objective" knowledge from individual "subjective" experience and so the ground for Tektology, physical experience, is prepared. The second point, the relation between technology and ideology as the "basic tools of human development", removes the possibility of a strictly objective knowledge, reducing the "truth" of any knowledge to a "that time" truth, as Sadovsky and Kelle point out in their foreword. Thus the value and use of Tektology is necessarily socially determined because the "physical knowledge" upon which it is based is also "socially determined".

And so, thus far we have a body of knowledge which displays many of the characteristics of modern systems theory and which is grounded in a physical knowledge underwritten by social or shared experience. Further, it is adaptive, in that the knowledge on which it is based is adaptive, the dynamic of technology and ideology which drives society will drive the development of Tektology as well. However the complexes as defined above are static, what is needed is a process of development.

Bogdanov provides this in the notion of "selection" ¹⁵. Selection in Tektology operates through a tendency, between or within complexes, toward equilibrium, Zeleny calls this process "equilibration" ¹⁶. Generally, in this process emergent combinations which result in conditions which most closely approximate a local equilibrium tend to persist whilst those which move away from or violate local equilibrium do not. "Conservative" selection, the first category Bogdanov introduces, is concerned solely with existence, whether or not the complex survives, therefore it is a boundary case.

The second category, "progressive" selection regulates the development of the complex. Positive progressive selection results in the growth of the complex, it "assimilates" more from its environment than it releases back, whilst under negative selection the opposite is the case. The possibilities for the continuation progressive selection in any one direction are necessarily limited; in the case of negative selection by the destruction of the complex through attrition and, in the case of positive selection, by the need for radical re-organization, Bogdanov calls these limits "crises". A further point is the location of the equilibrium, in "conservative" selection it is internal, whereas for "progressive" selection it is the equilibrium of the wider system which is capable of drawing internal equilibrium away from its preferred state and thus causing crises.

The crisis of the destruction of the complex is relatively self explanatory, however the crisis of positive selection is rather more interesting. The increase in size brings an increase in complexity up to and until the complex is no longer able to maintain itself under its present structure, at that point the process of equilibration forces a re-structuring which results either in the destruction of the complex in its present form, i.e. it disintegrates, that is it restructures into simpler complexes closer to the local equilibrium state, or its structure changes in such a manner that the stresses imposed by its increasing complexity are alleviated and a new equilibrium state is achieved.

The third major characteristic of the Tektology follows from Bogdanov's original statement as to the nature of the world. For him complexes are not faced by a single monolithic environment. The environment of each and every complex is comprised of all other complexes and nothing else. Each and every complex is constantly tending toward its own internal equilibrium *in a process of constant interaction* with each other complex it is in contact with and, through them, with *all* other complexes. Thus the Tektological cosmos is

constantly moving toward a myriad of local equilibria and, in this process, *actively changing* the conditions of those equilibria. Thus the cosmos does not exist as *state* but as *process*.

The Tektology demonstrates a systemic view of the world, but how does it compare to modern systems approaches? In this respect it is useful to use the "macro-paradigms"¹⁷ of systems thinking introduced by Vadim Sadovsky as a basis for the comparison. Sadovsky suggests that there are two macro-paradigms which characterize the systems thinking of this century, they are *equilibrium seeking* and *non-equilibrium seeking*. Elsewhere I have argued, together with Simona Pustyl'nik¹⁸, that perhaps "single equilibrium" and "multiple equilibrium" are more appropriate, she also suggested the addition of a third, that of "self-developing systems"¹⁹, which we later developed into "co-evolutionary". Thus we have three macro-paradigms which I will argue characterize the various systemic approaches available at the present time.

The first, single equilibrium systems, in agreement with Sadovsky, is characteristic of such approaches as von Bertalanffy's GST, cybernetics, as propounded by Ashby or Wiener, or the systems engineering/analysis methodologies insofar as the systems they tend to model seek a static, or algorithmically determined series of, equilibria. The notion of single equilibrium seeking is analogous to the survival criteria implied in Bogdanov's "Conservative Selection" thus systems or complexes of this type are attempting to achieve an optimal state in these words "survival".

Systems indicative of the second type are Prigogine's "self-organizing" systems, and, from the management field, Beer's VSM and Checkland's SSM. These systems share the attribute of being able to restructure themselves in response to environmental pressures, i.e. the wider system equilibrium which tends toward

internal crises, Prigogine's in relation to thermal stimulation, Beer's in response to environmental variety and the "algedonic signal" and Checkland's through socio-cultural pressures by way of a dialectical/discursive process. Crises as a result of positive "Progressive Selection" suggest similar characteristics.

The third macro-paradigm is represented by ideas such as Lovelock's Gaia and Laszlo's "Interconnected Universe". Both these conceptions, although at grossly different levels, approach the world/cosmos as almost infinitely interconnected with each part/element/system able to affect the conditions forming the environment for all other parts. Therefore the whole forms a *super-system* with its own internal regulative mechanisms. Bogdanov's notion of "world ingression" is directly analogous to this.

In almost all of the areas systems theory has touched, the Tektology has something to contribute. Bogdanov proposed a balanced systemic theory including negative as well as positive formulations of his theories, for example the notions of de-organizedness as well as organizedness, de-assimilation as well as assimilation which give the Tektology a feeling of completeness that is lacking in some of the other approaches.

Many things have been written about the Tektology before now, some sang its praises while others have been deeply critical. It is difficult to say why this book has been largely ignored except by a "dedicated few", Gorelik's translation of the "Essays" has been available for over fifteen years and numerous articles have been published, and so a lack of access cannot be the cause. Perhaps this edition will ease its path. There is no doubt that the Tektology is a difficult book to read, my own feeling is that Bogdanov felt himself to be wrestling with concepts that were troublesome to grasp, let alone explain in accessible language. His sentences and

conceptualizations are often tortuous and liberally endowed with unfamiliar words which Bogdanov felt the need to invent in order to convey his particular meaning. The abiding impression that the Tektology left on me is of a work which, although it may contain misconceptions or plain errors, is intuitively correct and, in some places demonstrates an astounding clarity of vision and insight which borders on genius. The principles and processes outlined in the Tektology operate in all places and at all times; as such tektological complexes function in many dimensions simultaneously. Such complexes are difficult, if not impossible, to envisage as the natural tendency is to "change one variable at a time" an approach which denatures them and, by association, the Tektology. My advice to the reader is to take the time to absorb the Tektology, read it in a forgiving manner, remembering when it was written, and make the effort to envisage the implications of what Bogdanov was attempting to convey — it is an exercise that will be well rewarded.

A project of this size and complexity exacts a toll beyond those directly involved. In signing his preface to the second edition (dated November 19, 1921) Bogdanov "hails the collaborators and dedicates his book to them", it seems reasonable that I should do the same.

Hailing my collaborators — my wife Melonie and my daughters Kasenya, Ciara and Freyja — I dedicate this edition to them.

Peter Dudley
Hull
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¹Gorelik, G., (1975) "Principal Ideas of Bogdanov's "Tektology" // General Systems Yearbook, Vol. XX.

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- ²Kotarbinski's Praxiology, P. Dudley (ed.) Centre for Systems Studies Press, Hull, 1995.
- ³Bogdanov A. A. (1989) *Tektology: The Universal Science of Organization*, Ekonomika, Moscow.
- ⁴Gorelik, G., (1975), "Principal Ideas of Bogdanov's "Tektology" // *General Systems Yearbook*, Vol. XX; Sadosky, (1992), *Systems Thinking on the Threshold of a Third Millenium*, *Systemist*, 14, 1; Susiluoto, A., (1982), *Origins and Development of Systems Thinking in the Soviet Union: Political and Philosophical Controversies from Bogdanov and Bukharin to Present day Revelations*, *Annales Academiae Scientiarum Fennicae Dissertationes Humanarum Litterarum*, 30; Zeleny, M., (1988), *Tectology // International Journal of General Systems.*, vol. 14
- ⁵Dudley and Pustynnik (1995), *Reading the Tektology: Provisional Findings, Postulates and Research Directions*, Centre for Systems Studies Research Memorandum 7, Hull.
- ⁶Bertalanffy, L. von. (1968) *General System Theory: Foundations, Development, Applications*, Braziller, N.Y.
- ⁷Wiener, N., (1948), *Cybernetics or Control and Communication in the Animal and the Machine*, Wiley.
- Ashby, W.R. , (1956), *An Introduction to Cybernetics*, W. Clowes and Sons, London.
- ⁹Prigogine, I., (1980), *From Being to Becoming: Time and Complexity in the Physical Sciences*, Freeman, San Francisco; Prigogine, I., and Stengers, I., (1984), *Order ut of Chaos: Mans New Dialogue with Nature*, Flamingo, London.
- ¹⁰Beer, S., (1979), *The Heart of the Enterprise*, Wiley, Chichester; (1981), *The Brain of the Firm*, 2nd. ed., Wiley, Chichester; (1989) *The Viable System Model: its Provenance, Methodology and Pathology //The Viable System Model: Implications and Applications of Stafford Beer's VSM*, Espejo, R., and Harnden, R., eds., Wiley Chichester.
- ¹¹Checkland, P.B. (1981), *Systems Thinking Systems Practice*, Wiley, Chichester; Checkland, P. B., and Scholes, S., (1990), *Soft Systems Methodology in Action*, Wiley, Chichester.
- ¹²Bogdanov, A. A. (1965), *Matter as Thing in Itself*, // *Russian Philosophy*, Vol III, Edie, J. M., Scanlan, J. P., Zeldin, M-B., eds., G. Kline trans., Quadrangle, Chicago, pp. 390-404.
- ¹³Bogdanov shows remarkable sophistication of thought in this respect identifying in addition to the categories of organizedness the notions of "Analytical" and "Practical" sums. His argument is that in all cases the combination of elements will result in losses as per, for example, the laws of thermodynamics this calculation of activities he calls the "analytical sum". Organizedness,

the case where the whole is greater than the sum of its parts is only possible in regard to specific goals, in this case the "gain" is real in an objective sense, only in relation to the resistances that have to be overcome, this is the "practical sum".

¹⁴Vucinich, A., (1976), *Social Thought in Tsarist Russia*, University of Chicago Press, London, pp. 214/5.

¹⁵There are problems inherent in the use of the word "selection" as a translation for the Russian *podbor*, although it is widely accepted and has been used throughout this translation. Simona Pustynnik, ("Assemblage as the basis of Bogdanov's Tektology" // *Voprosy Filosofii*, No. 8, 1995 (in Russian)) suggests the term assemblage as being more appropriate, as the term selection does not adequately reflect the systemic character of Bogdanov's term *podbor*. Her argument is that this term is closer, in Bogdanov's usage, to the modern understanding of systemic evolutionism than the Darwinian sense of selection.

¹⁶Zeleny, op. cit

¹⁷Sadovsky, op. cit.

¹⁸Dudley and Pustynnik, op. cit.

¹⁹Pustynnik, S., (1994), *Ideas of Evolution in A. Bogdanov's Tektology // The Concept of Self Organization in a Historical Perspective*, Moscow, pp. 189-198 (in Russian).